

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WSG 22

Date Signed: January 27, 1983

Revised: December 1999

MEMORANDUM

SUBJECT: Problems Associated with Disinfectant Changes

FROM: Victor J. Kimm, Director (signed by Victor J. Kimm)
Office of Drinking Water (WH-550)

TO: Holders of Water Supply Guidance Manual

The Office of Drinking Water has received reports of problems resulting from some water systems changing from free chlorination to the use of chloramines in an effort to reduce disinfection by-product formation. Most commonly, owners and distributors of tropical fish have reported losses.

Of even greater potential significance, there have been reports of hemolytic anemia occurrence in patients on kidney dialysis when chloramines are present in the dialysis water. While water used in dialysis should be treated to remove potentially harmful chemicals, such treatment is sometimes omitted.

The guidance recommends that utilities changing disinfectants notify the public of the change, and that hospitals, kidney dialysis facilities and fish breeders be alerted to the potential significance of the change.

Attachment

Background

For years, many public water systems have added chloramines (chlorine plus ammonia) to drinking water as a primary or secondary disinfectant. Also, when breakpoint chlorination is not practiced, both inorganic and organic chloramines may be present in finished drinking water. Because of concern regarding the formation of disinfection by-products from disinfectants and organic matter, and in some cases because of requirements for compliance with drinking water regulations limiting disinfection by-product concentrations, a number of water supply systems have switched, or are contemplating switching, from chlorine to chloramine or chlorine dioxide as their primary disinfectant. Any water supply which plans to change disinfectants should be made aware of the potential problems created by such a change, and should notify consumers, particularly those most likely to be affected in advance of the change. Care should also be taken to avoid unnecessarily high levels of combined residuals.

A potentially serious problem arises when tap water containing chloramines is used in hemodialysis (artificial kidney machines). Chloramines pass through the dialysis membrane and their toxicity to patients under dialysis conditions is undisputed (Eaton et al. 1973). Chlorine dioxide and its by-products may have similar effects. Operators of dialysis centers know that tap water must be treated before use in dialysis. The Association for the Advancement of Medical Instrumentation has proposed a limit of 0.1mg/L for chloramine in hemodialysis water. It is imperative that dialysis centers and users of home dialysis systems be informed that chloramines or chlorine dioxide are to be used in the public water system and that treatment to remove them is essential. Other substances in tap water besides chloramines are also known to interfere with dialysis. These include copper, fluoride, sulfate, nitrate, zinc and aluminum. The types of controls available to users include carbon filtration and reverse osmosis or chemical reduction.

The toxicity of chloramine to fish is well-known. Most breeders and owners of tropical or other aquarium fish know that tap water should not be used in aquaria without proper treatment and aging. Yet, a number of cases of aquarium fish being killed by chloramine in tap water have been reported, particularly when conversion between disinfection methods has occurred at the treatment plant. Since chloramine is more persistent than free chlorine (which is also toxic to fish), treatment and aging of water to be used in aquaria is more critical when chloramine is present. Suggested action for fish fanciers, breeders, or pet shop owners includes the use of activated carbon filters. Care needs to be taken to replace filter cartridges before breakthrough can occur.

Guidance

In addition to the regulatory requirements to consult with the primacy agent prior to making a significant modification to their disinfection practices, the Office of Ground Water and Drinking Water recommends that utilities changing disinfectants notify the public of the change and that this notification, the text and announcement schedule be included in the plan. In particular the notification should include hospitals, kidney dialysis facilities and fish breeders.